



Indian Institute of Science Bangalore

Dr. Mayank Shrivastava
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Indian Institute of Science Bangalore
560012, Bangalore, Karnataka, India

Inquiry Number: DESE/JK/MS/10/2016-17

Dated: 08/06/2016

Request for Quote for the procurement of an Electron Beam Physical Vapor Deposition System

**Indian Institute of Science, Bangalore
(Last Date for submission of tenders: July 15th, 2016)**

Dear Sir/Madam,

Kindly send your best quotation for the following item with various accessories on C.I.P. Bangalore basis to the undersigned. Your quotation should clearly indicate the terms of delivery, delivery schedule, entry tax, payment terms, etc.

The tender should also include mode of payment. The tender should be submitted in two separate sealed envelopes - one containing the technical bid and the other containing the commercial bid, both of which **should reach the undersigned, duly signed on or before 12:00 hours (IST) on July 15th, 2016.**

The technical bid must include all details of technical specifications of the equipment along with the commercial terms and conditions (masking only the price component), the bill of materials, printed technical brochure and any other supporting document. **Please enclose a compliance certificate, printed on your letter head, along with the technical bid.**

The commercial bid must include the price of the item in Indian / Foreign currency, indicating the following separately:

- FOB price
- Freight and Insurance
- Agency commission in Indian rupees for any presale work, installation, commissioning and warranty
- Post warranty maintenance charges
- Total

The quotation should be address to:

The Chairman,
Department of Electronic Systems Engineering
Indian Institute of Science
Bangalore – 560 012

To Whom It May Concern

This is a RFQ (Request For Quote) for procurement of an **electron beam physical vapor deposition system (referred to as EBPVD in the RFQ)** to be installed at the National Nanofabrication Facility (NNFC) in Center for Nano Science and Engineering (CeNSE), Indian Institute of Science, (IISc) Bangalore. The Centre is a platform for interdisciplinary research in IISc and houses a 14000 sq. ft device fabrication facility (NNCF) and a 9000 sq. ft. characterization facility (MNCF). It is also national user facility that is accessible to industry and academia through the Indian Nanoelectronics Users Program (INUP). The EBPVD facility being procured through this RFQ will be part of the National Nanofabrication Center that supports the activities in and out IISc. About 50 faculty members from all over IISc are associated with it in one way or another. This way the centre is unique in the annals of IISc and in many ways is indeed unique in India. The visibility of tools that are placed at the national facility to the Indian user base and International Industry is hence unprecedented.

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Note: To the extent possible, **the EBPVD price should be broken up into as many individual components.** This aids price comparison on commercial bids.

Procedure:

1. Vendors will be required to submit a technical proposal and a commercial proposal in **two separate envelopes.**
2. The deadline for submission of proposals is the 15th July, 2016, 12:00 Hrs (IST). Direct all technical questions concerning this acquisition to Prof. Srinivasan Raghavan, CeNSE, IISc at sraghavan@cense.iisc.ernet.in (Phone: +91-98802-08054). Proposals in the sealed envelope should arrive at the office of Prof. Mayank Shrivastava, DESE, Indian Institute of Science, India, 560012 by/before the above deadline.
3. The technical proposal should contain a compliance table that should describe your compliance in a “Yes” or “No” response against each of the items in the table listed in this RFQ. **If “No”, the third column should state the extent of deviation and reasons if any.** The fourth column can be used to compare your tool with that of your competitors or provide details as requested in the technical requirements table below.
4. Items in addition to that listed in the technical table that you would like to bring to the attention of the committee can be listed at the end of the compliance table.
5. **Vendors are encouraged to highlight the advantages of their tools over comparable tools from the competitors.**

Technical Requirements: Please note that the requirements listed below are only guidelines. It does not disbar tools that do not meet the criteria listed. Vendors are requested to quote for tools that meet the criteria to the best extent possible and list deviations. Deviations are NOT an automatic reason for disqualification. They will be discussed by the technical committee prior to making an informed decision. The final decision of whether to qualify or not qualify a technical bid rests with the technical committee set up by the Director of the Institute for this procurement.

The e-beam system defined below is for purposes of academic research. The configurations below should have the option of including a load lock for substrate and/or source loading that should be quoted for as an option and that can if need be interfaced separately with the system at a later date. The following configurations need to be quoted for separately:

1. Configuration 1: One 2” wafer + One e-beam gun + One optional load lock.
2. Configuration 2: Four 2” wafers + One e-beam gun + One optional load lock
3. Configuration 3: One 2” wafer + Two e-beam guns+ One optional load lock.
4. Configuration 4: Four 2” wafers +Two e-beam guns + One optional load lock

It is understood that the chamber size will increase with increase in number of wafers and e-guns. The pumping system for the chamber size required needs to be chosen such that the pumping time to 1×10^{-6} Torr is less than 15 minutes (You may optionally highlight the cost saving in your commercial bid if it is 1×10^{-6} Torr in 30 minutes). More details are given below.



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Technical Details for Compliance Table: Please add columns detailing compliance, deviations if any and highlight advantages over customers.	
1.	Pumping: The chamber volume and the capacity of the pumping provided should be such that a pressure of $<1 \times 10^{-6}$ Torr is achieved in 15 minutes and a pressure of $<1 \times 10^{-7}$ Torr in less than 60 minutes. (You may optionally highlight the cost saving in your commercial bid if it is 1×10^{-6} Torr in 30 minutes)
2.	Pumping: It is preferred that the above pumping be achieved with a combination of a turbo pump (preferably Pfeiffer) and a DRY backing/roughing pump.
3.	Pumping/Loadlock: A load lock that allows changing of both wafers (2") and/or target materials must be quoted as option/options.
4.	Pumping/Loadlock: The ability to buy the load lock separately and integrate it at a later stage must be included in the technical bid.
5.	Pumping/Loadlock: The price for integrating the loadlock separately at a later date and the time for which this price is valid must be included in the commercial bid.
6.	Pumping/Loadlock: The possibility of getting down to a base pressure of 1×10^{-9} Torr with a suitable combination of pumping system + load lock should be quoted as an option.
7.	Pumping/Leak Testing: A leak test port with isolation valve and $\frac{1}{4}$ " (VCR type) face seal fitting should be provided for connecting a He leak detector.
8.	Substrates: The e-beam evaporator is being procured for deposition on 2" substrates and smaller pieces in an academic setting.
9.	Substrates (Configuration 1): The substrate stage should be capable of taking <u>one</u> 2" substrate and pieces, should have rotation built in and should have the capability of heating substrates up to 300°C.
10.	Substrate heating: In addition to the above heating of substrates to temperatures above 300°C should be quoted as an option to help deposit refractory materials. The temperature option available should be included in the technical bid and quoted for separately in the commercial bid.
11.	Substrates (Configuration 2): A substrate stage that can accommodate up to <u>four</u> 2" substrates, has rotation built in and has the capability of heating substrates up to 300°C should be quoted as an option.
12.	Substrates: If available, a system that allows for simultaneous loading and pumping of all 4 wafer platforms, but sequential deposition, should be quoted.
13.	Electron source (Configuration 1 and 2): A 10 kW electron source (~ 10 kV and ~ 1 A) that can be controlled to yield point heating and distributed heating for evaporation of a range of materials such as Au, Ti, Ni ($2 \text{ \AA}/\text{sec}$), Ta ($1 \text{ \AA}/\text{sec}$), Al ($5 \text{ \AA}/\text{sec}$). The minimum controllable deposition rates are given above. The maximum controllable rates possible, taking into consideration such as crucible failure, should be included in the quote. The sweeping of the electron beam should be programmable.
14.	Electron source (Configuration 3 and 4): The option of having two guns for co-evaporation should be quoted as options. Configuration 1 and 2 with two guns constitute configurations 3 and 4.
15.	Electron source-Target distance: The system should be designed to yield uniform deposition, $\pm 5\%$, at the above rates in all the configurations mentioned against point 9 and 10. The ability to adjust source to target distance should be quoted as an option.
16.	Deposition rate monitoring: Quartz crystal monitors should be provided to monitor deposition rates at the substrate plane. In addition, quartz crystal monitors should be provided above the source plane and below the shutter to stabilize evaporation rates prior to exposing the substrates to the metal flux.
17.	Shutters: A suitable shutter mechanism should be provided above the source place or below the substrate plane to isolate the substrate during the period of flux stabilization.

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18.	Gas flow: 3 gas flow lines with mass flow controllers and suitable valving should be provided for flushing the chamber. This should be quoted on a per line basis as an option. We expect a requirement for Ar, O ₂ and N ₂
19.	Hearth: The hearth needs to be able to house up to 5 evaporation sources of 15 cc each.
20.	Shields: Two sets of removable shields should be provided to minimize deposition on chamber walls.
21.	Ion beam: An ion beam, neutralizer and its details for pre-deposition cleaning should be quoted as an option.
22.	System control: All important machine parameters should be controlled through a PLC and accessible through a touch pad human machine interface (HMI) or a laptop.
23.	System control: A list of all safety interlocks available on the system and the cause/effect diagram that summarizes these safety features should be part of the technical bid.
24.	Chamber should be pumped by the roughing pump independently (and not only through the turbo pump). This in principle requires one extra KF valve, while making sure the turbo never sees high pressure to improve reliability.
25.	Process recipes: Process recipes for deposition of the said metals and other should be provided and should be programmable through the HMI. Vendors who have optimized process recipes and demonstrate these during installation will be preferred. The combination of electron beam parameters, metal and metal holders that result in consistent evaporation with consistent lifetime of crucible from specified sources is available with the vendor for the said system, should be listed in the technical bid. Vendors who can provide such information will be preferred.
26.	Process demonstration: The technical bid should contain details of process recipes that will be demonstrated at time of installations.
27.	View ports: The system should have view ports, suitable shuttered and bolted to the system through conflat metal seals that allow for monitoring of sources (mandatory) and substrates (optional) should be provided. As part of the technical bid the location of these ports should be indicated.
28.	Utility requirements: A list of utility requirements should be part of the technical bid. The system should be compatible with 240±10V, 50 Hz single phase or 415±20V, 50 Hz 3 phase supplies.
29.	Foot print: A floor plan should be part of the technical bid.
30.	Spares: A standard set of spares should be mentioned in the technical bid and included in the commercial bid as an option.
31.	Maintenance: The cost of an annual maintenance contract and cost of emergency technical support that may involve an engineer being on site should be quoted for in the commercial bid and addressed in the technical bid. The availability of trained engineers in India for servicing the system will be preferred.
32.	Maintenance: On all systems a set of basic tools required for performing routine maintenance. A tool cart that can be locked and that can accommodate these tools should be provided.
33.	Manuals: System operation, process and troubleshooting manuals are a must. Their inclusion must be indicated in the technical bid.
34.	Shipping: On all systems the cost of shipping up to IISc should be included. IISc will help with customs clearance at Bangalore Airport. Please include your payment option. IISc would prefer to retain at least 20% of payment till instruments have been commissioned and successfully demonstrated.

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35.	Acceptance test criteria: On all systems please list a set of acceptance tests for on-site (vendor) inspection and after installation at IISc.
36.	Terms and Conditions: On all systems the payment terms will be specified in the technical and commercial proposal and is subject to negotiation.
37.	Indian Presence: Please provide details of the number of trained personnel in India who can service the machine, the number of tools sold in India and the corresponding number in the southern region or in Bangalore.
38.	International Presence: At least 3 references from preferable academic settings in either India or abroad should be included in the technical bid

All interested contractors shall submit a response demonstrating their capabilities to produce the requested equipment to the Primary Point of Contact listed below.

All of the above mentioned technical specifications are highly desired. However, lower technical specifications may be considered if the above mentioned specifications are found to be unsuitable in financial terms. The Institute reserves the right to go for lower specifications taking into consideration its technical preferences and financial constraints. Vendors are encouraged to highlight the advantages of their tools over comparable tools from the competitors.

Terms and conditions (if not specified above):

1. Onsite installation cost, if any, should be included in the commercial bid. We prefer to have free installation.
2. Software upgrade, if any, must be free of cost for next 5 years.
3. The vendor must give assurance that there are no bugs and glitches with the software.
4. In case of software issues, vendor should be able to provide required solution within two days.
5. Equipment must be well calibrated.
6. Additional quote for an annual maintenance contract should be included for the next 5 years.
7. The vendor should have a good track record of delivering such equipment at universities/research institutions (please furnish the details).
8. Please provide list of customers who have procured your equipment in last 5 years.
9. The vendor should be able to repair, maintain and upgrade the equipment, once it is installed in India. No travel claims must be made by vendor for servicing during the warranty/guarantee time.
10. The lead time for the delivery of the equipment should preferably be as less as possible, but not more than 12 weeks from the date of receipt of our purchase order. The smallest lead time will be appreciated.
11. On all systems the payment terms will be specified in the commercial proposal and is subject to negotiation.
12. The validity period of the quotation should be 90 days at least.
13. Please provide details of the number of trained personnel in India, number in the southern region or in Bangalore who can service the machine.
14. Highlight the system/computer requirement, if any.
15. Successful commissioning, installation, demonstration of use, trouble shooting and maintenance of specific components at IISc, Bangalore should be done within two weeks of delivery.
16. Successful demonstration of instrument performance in terms of precision of equipment as mentioned in this document/compliance certificate mentioned by the vendor. Compliance statement should be enclosed along with the offer
17. Documentary proof/catalogue of different modules/published technical notes should be provided to support the quoted specifications and applications.
18. Softcopies (whenever applicable) and hard copies of instrument manuals, service manuals & certificates for analytical capabilities should be provided.
19. List of important spare parts, consumables and accessories with their part number and costing should be provided in the option.

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20. The company should give an undertaking that the necessary components, spares, consumables or any other item required for the proper working of the equipment should be supplied for at least 5 years from the date of installation of the equipment.
21. Supplier should provide comprehensive onsite warranty (including parts and labor) for minimum 1 year (12 months) after successful installation of the system. The supplier should also quote for annual maintenance contract on a regular basis after the warranty period as an optional item. The AMC cost should be valid for atleast 5 years. The supplier should also certify to provide guaranteed supply of spares for at least 5 years. It should include minimum two preventive visits per year or all breakdown calls. Instrument down time should not be more than one week in normal circumstances. In case of delay extra down time will be added to the warranty period.
22. On site basic training of 5 working days on operational aspect of instrument at IISc, Bangalore without any additional cost.

Direct all technical questions concerning this acquisition to Prof. Srinivasan Raghavan at sraghavan@cense.iisc.ernet.in (Phone: +91-98802-08054).

Sincerely,

Dr. Mayank Shrivastava
Assistant professor
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India
Phone: +91-95911-40309
(On Behalf of Purchase Committee)